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hour before sunrise, and on August 31st shortly after midnight. It is in the eastern part of *Taurus* and moves about 7° eastward nearly to the border of *Gemini* during the two months. As seen in the telescope, the rings present about the same appearance as they did earlier in the year, the apparent minor axis being about 44 per cent of the major.

Uranus rises at about half-after nine on July 1st, and on August 2d comes to opposition with the Sun, rising at sunset. At the end of August it will be above the horizon until about 3 A. M. It is in the constellation *Capricorn*, about 11° west and 3° south of *Jupiter*, and at the end of August the distance has diminished to about 6° west and 2° south. This is on account of the greater westward motion of *Jupiter*, *Uranus* moving about 2° westward in the period. No bright star is near.

Neptune is in conjunction with the Sun on July 21st, changing from an evening to a morning star, but is too near the Sun for observation even with a telescope.

PLANETARY PHENOMENA FOR SEPTEMBER AND OCTOBER, 1914.

BY MALCOLM McNEILL.

PHASES OF THE MOON, PACIFIC TIME.

Full Moon ...	Sept. 4, 6 ^h 1 ^m A.M.	Full Moon	Oct. 3, 9 ^h 59 ^m P.M.
Last Quarter ..	" 12, 9 48 A.M.	Last Quarter ..	" 12, 1 33 A.M.
New Moon ...	" 19, 1 33 P.M.	New Moon	" 18, 10 33 P.M.
First Quarter..	" 26, 4 3 A.M.	First Quarter .	" 25, 2 44 P.M.

The fourth and last eclipse of the year, a partial eclipse of the Moon, will occur on the morning of September 4th. No part of it will be visible from the eastern part of the United States, but a part may be seen in the far west. The circumstances of the eclipse are as follows, Pacific time:—

Moon enters penumbra	September 4, 3 ^h 1 ^m A.M.
Moon enters shadow	" 4, 4 16 A.M.
Middle of eclipse	" 4, 5 55 A.M.
Moon leaves shadow	" 4, 7 33 A.M.
Moon leaves penumbra	" 4, 8 48 A.M.

The maximum obscuration will be 86 per cent of the Moon's diameter.

The autumnal equinox, when the Sun crosses the equator from north to south, occurs September 23d, shortly after 1 P. M. Pacific time.

Mercury on September 1st is an evening star, having passed superior conjunction with the Sun on August 30th, but is entirely too near the Sun for naked-eye view, and this condition remains thruout the month. The planet, however, will become visible as an evening star toward the middle of October. It reaches greatest east elongation, $24^{\circ} 52'$, on October 15th, and then sets not quite an hour and a half after sunset. The greatest elongation is greater than the average, as the planet passed its aphelion on September 29th. The visibility lasts for only a few evenings, as by the end of October the planet has nearly reached inferior conjunction. East elongations during the autumn seldom yield as good conditions for visibility as the present one. There will be two conjunctions of *Mercury* and *Mars*, one on the night of October 5th-6th and the other early in the morning of October 30th. In each case *Mercury* will be a little more than 2° south of *Mars*.

Venus thruout September sets about an hour and three quarters after sunset. The interval shortens about half an hour during October, being about an hour and a quarter on October 31st. It reaches its greatest east elongation from the Sun on the morning of September 18th. The distance, $46^{\circ} 27'$, is perhaps 1° greater than the average, as *Venus* was in aphelion only thirty-six hours before. The almost perfect circularity of her orbit makes all greatest elongations practically of the same size, in strong contradistinction to the case of *Mercury*, where they differ as much as 10° . As seen in the telescope at time of greatest elongation *Venus* will have a half-moon shape. As the planet approaches inferior conjunction the half-moon shape changes to a gradually narrowing crescent, which disappears entirely at conjunction. At the same time the planet is rapidly approaching the Earth and its apparent size is increasing. The brightness of the planet will increase until the planet is about half-way between greatest elongation and inferior conjunction. This occurs on the morning of October

23d. For some weeks before and after this time *Venus* will be bright enuf to be seen in full daylight. It is not always easy to find it by daylight, but when once seen it is very obvious.

Mars is still to be seen in the evening sky, but is so much fainter and so near the Sun that it is not very obvious. On September 1st it sets about an hour and twenty minutes after sunset. This diminishes to less than an hour by October 1st, and to about forty minutes on October 31st. As the planet also almost reaches its greatest distance from the Earth and is at the same time gradually nearing the Sun, it attains its least brightness in October several weeks before time of conjunction with the Sun. Its brightness will vary very little from September 1st to the end of the year, and will be not greatly different from that of a standard second-magnitude star like the Pole Star. The conjunctions of *Mars* and *Mercury* have already been mentioned.

Jupiter is in fine position for evening observation, remaining above the horizon on September 1st until about half-after three, and about half-after eleven on October 31st. It remains in the constellation *Capricorn*, retrogrades or moves westward a little more than 2° until October 9th, and then moves about 1° eastward by the end of the month. It will be in close conjunction with the Moon on the night of September 1st-2d, the morning of September 29th, and at about noon on October 26th. In all three instances the planet is north of the Moon. The last conjunction of the three is the closest, and will be an occultation for some parts of the southern hemisphere.

Saturn rises at about midnight on September 1st and shortly after 8 P. M. on October 31st, so it is getting around again in fair position for evening observation. It is on the border-line of the constellations *Taurus* and *Gemini* and moves eastward nearly 2° until October 15th; it then begins to retrograde and at the end of October is almost exactly in the same position it occupied at the beginning of the month. It is seldom that the line of retrograde motion corresponds so exactly with the line of direct or eastward. The apparent width of the rings remains practically unchanged.

Uranus is also in good position for evening observation, not setting until nearly 3 A. M. on September 1st and not until

nearly 11 P. M. on October 31st. Like *Jupiter*, it is in the constellation *Capricorn* and lies 5° to 6° west of the brighter planet. Its motion is small, about 1° westward until October 18th, and then a little eastward. There is no even moderately bright star near enuf to afford an easy identification of the planet.

Neptune rises somewhat after 2 A. M. on September 1st, and shortly before half-past ten on October 31st. It moves about 1° eastward in the extreme western part of *Cancer*.

NOTE ON THE ILLUSTRATIONS IN THIS NUMBER.

The frontispiece of the present number of these *Publications* is a reproduction of a photograph taken by Mr. C. A. BERGMANN, Assistant in the Lick Observatory. The first and third of the frame buildings (counting from the right) and the three-story reinforced concrete building in the center, on the main peak, are the new residence buildings, completed in 1913, to replace the large brick dormitory which had to be taken down on account of damages wrought by the earthquake of July, 1911. The buildings faintly seen in the background on the right are in the city of San Jose, thirteen miles, in a direct line, from the observatory.

The two fog views are also from photographs by Mr. BERGMANN and illustrate typical conditions at Mount Hamilton in the early spring months. COMMITTEE ON PUBLICATION.

NOTICE TO MEMBERS AND CORRESPONDENTS OF THE SOCIETY.

A General Index of the first twenty-five volumes of these *Publications* will be printed during the present summer and a copy will be sent to each member and correspondent of the Society in lieu of the usual August number of the *Publications*. The price for additional copies, and for copies to those who are not members will be \$1.75, postage paid. Orders may be sent to Mr. D. S. RICHARDSON, 752 Phelan Building, San Francisco.

The next regular number of the *Publications* will appear in October, 1914. COMMITTEE ON PUBLICATION.